

DEVICE FOR STACKING TUBE SECTIONS FOR PRODUCING BAGS

The invention relates to a device for stacking tube sections for producing bags, with a transporting facility, which supplies the tube sections to a stacking station.

For producing bags of paper or film, an endless tube is frequently produced first and then divided into individual tube sections, each of which forms a bag. The individual tube sections, which are transported continuously and consecutively with a transporting facility, are then frequently, to begin with, collected in a stack. Only in a later operation are the ends of the tube sections closed and the bags optionally filled with their content.

For certain applications, bags are required, which have multilayer walls, for example, a wall with a layer of paper and at least one layer of film, which is impermeable to air. One example of such bags is inflatable bags, which are used as supporting cushions for the transport of goods.

Frequently, particularly in the case of multilayer bags that are relatively long, it often proves to be difficult to stack the tube sections cleanly one above the other. When a freshly supplied tube section is pushed or pulled during a stacking process over the uppermost tube section, which is already lying on the stack, the individual layers of material can easily slip out of place relative to one another and/or form folds, so that a clean stack and a satisfactorily further processing are not possible.

It is an object of the invention to provide a device, which makes clean stacking possible even in the case of tube sections of a flexible, slack or multilayer material.

Pursuant to the invention, this objective is accomplished owing to the fact that the transporting facility has an upper transport and a lower transport and that the lower transport, in the region of the stacking station, is formed by two endless conveyor belts, which revolve above the stacking station outside of the lateral edges of the tube sections, and by at least two cross members, which are disposed with uniform spacing, the spacing corresponding to the spacing of the leading edges of the tube sections, which are supplied consecutively.

With the help of the transporting facility, the tube sections are supplied above the stack, which is being formed. At the same time, the leading edge of a tube section is clamped between the upper transport and one of the cross members of the lower transport. When the stacking position is reached, the cross member of the lower transport reaches the turn-around roller, at which the conveyor belt is turned around and, consequently, the clamping of the leading edge between the upper transport and the lower transport is canceled, so that the tube section drops onto the stack. While the next tube section with the subsequent cross member is being supplied, the turned-around cross member is returned on the lower section of the conveyor belt. In so doing, it moves on a path, which is also above the stack that is being formed. The trailing rear part of the newly supplied tube section, which is clamped only at the front edge, is therefore kept away from the upper side of the stack by the returning cross member, so that it does not graze over the stack and therefore cannot shift the tube sections present there. Only after the tube section, newly supplied, has been allowed to drop, has the lower cross member moved back so far, that it releases the trailing edge of this tube section.

It is a further object of the invention to provide a method for stacking tube sections, especially tube sections of a multilayer material, for producing bags, for which the tube section is clamped with its leading edge between a cross member of a lower transport and an upper transport and supplied in a position above the stacking station, while a different cross member of the lower transport, which is returned above the stacking station to the upstream end of the transporting facility, keeps the trailing, rear

part of the tube section away from the stack until the leading edge is released by the first cross member and the tube section falls onto the stack.

Advantageous developments of the invention arise out of the dependent claims.

Preferably, the lower transport has precisely two cross members, which are disposed diametrically opposite to one another on the conveyor belts.

Preferably, the lower transport extends somewhat beyond the upper transport at the downstream end of the transporting facility, so that the released tube section can fall freely onto the stack.

The released tube section can be pressed down in the direction of the stack by one or more leaf springs, which are disposed in stationary fashion in the upper transport, so that the depositing of the tube section on the stack is accelerated.

The action of depositing the tube sections flush on the stack can be aided by stops at the stacking table. Preferably, the stacking table is formed by a conveyor, with which the stack can be transported away as soon as it has reached the desired height.

A severing device, in which the endless tube is divided into individual tube sections, preferably is disposed upstream from the transporting facility above the stacking station. The transporting speed of the transporting facility above the depositing station preferably is greater than the transporting speed, with which the tube is supplied to the severing device. Since the tube sections, upon entering the stacking device, accordingly are accelerated, spaces are formed between the consecutively supplied tube sections and provide sufficient time for depositing the tube sections on the stack.

The lower transport must be synchronized with the tube sections supplied, so that each cross member arrives at the same time with the leading edge of a tube section

supplied at the upstream end of the transporting facility. Since the spaces, formed between the individual tube sections because of the acceleration depend on the difference between the transporting speeds, the distances between the leading edges of consecutive tube sections can be adapted to the spacing of the cross members of the lower transport.

Particularly in the case of multilayer tube sections, the severing device is constructed preferably as a tear-off head, with which the individual layers of material of the tube are torn off at previously formed perforation sites. Due to the acceleration of the tube sections upon entry into the transporting facility of the stacking device, the tensile stress, required to tear of the tube sections, can be produced at the same time.

Preferably, at the upstream end, the transporting facility of the stacking device has an inlet section, in which the vertical distance between the upper transport and the lower transport becomes narrower, until finally the leading edge of the tube section is clamped. The clamping site preferably is defined by a clamping roller, which can be adjusted in the longitudinal direction so that it can be adapted for different lengths of the tube sections.

In the following, an example of the invention is explained in greater detail by means of the drawing, in which

Figure 1 shows a diagrammatic side view of a stacking device,

Figure 2 shows a device of Figure 1 in plan view and

Figures 3 and 4 show side views of a device, similar to that of Figure 1, however for different phases of the stacking process.

The stacking device, shown in Figure 1, has a stacking station 10, above which a transporting facility 12 with an upper transport 14 and a lower transport 16 is disposed.

An endless, multilayer tube 18 is supplied from the right in Figure 1 with the help of upper and lower conveyor belts 20, 22. The walls of the tube 18 consist of several layers of material, which, to begin with, are perforated at positions preferably offset somewhat with respect to one another in the longitudinal direction.

Behind the conveyor belts 20, 22, the tube 18 enters a tear-off head 24, which is also formed by the upper and lower conveyor belts 26, 28. The transporting speed of the tear-off head 24 is greater at least on a phase level than the transporting speed of the conveyor belts 20, 22, so that a tensile stress is produced in the tube 18. When the aforementioned perforation site reaches the space between the downstream end of the conveyor belts 20, 22 and the upstream end of the tear-off head 24, this tensile stress causes the tube section 30 to be torn from the endless tube 18.

At this instant, the leading edge of the tube section 30 has already entered the inlet section 32 of the transporting facility 12. The inlet section is formed by several parallel upper and lower conveyor belts 34, 36, the transporting speed of which is identical with that of the tear-off head 24. The vertical distance between the upper conveyor belts 34 and the lower conveyor belt 36 gradually decreases in the transporting direction, so that it becomes possible to introduce the leading edge of the tube section 30 reliably. A clamping roller 38 directs the lower half of the upper conveyor belts 34 somewhat in the downward direction, so that the leading edge of the tube section 30 is clamped at the instant, at which the trailing edge of the endless tube is torn off. The clamping roller 38 can be adjusted to adapt to the length of the tube section 30.

The transporting path, formed by the inlet section 32, is inclined slightly upwards, so that the tube sections, during the further transport, reach a certain height above the stacking station 10. In the region above the stacking station, the upper transport 14 is formed by several parallel conveyor belts 14, which extend in the horizontal direction and share a turn-around roller 42 with the conveyor belts 34. The lower transport 16 is formed here by two conveyor belts 44, which run over two turn-

around rollers 46 and, as can be seen more clearly in Figure 2, lie outside of the lateral edges of the tube section 30. The conveyor belts 44 are connected by cross members 48, 50 only at two places and are synchronized by positive driving mechanisms, such as cogged belts. The cross members 48, 50 are disposed at the conveyor belts 44 in diametrically opposite positions, so that they have equal spacing to one another on both paths along the conveyor belts 44 and consequently reach the turn-around roller at the same time. In the state, shown in Figure 1, the leading edge of a tube section 30 is clamped by the conveyor belts 40 of the upper transport and held by the cross member 48. The trailing, rear end of this tube section 30 rests on the other cross member 50, which returns on the lower half of the conveyor belts 44 to the upstream turn-around roller 46. In this way, the tube section 30 is kept away from an already formed stack 52 of tube sections, which rests in the stacking station 10 on a stacking table 54, which is constructed as a conveyor.

In Figure 2, the stacking device is shown in plan view. To improve the clarity, only the upper conveyor belts 20, 36 and 34 with their respective turn-around rollers are shown on the supplying side. In the downstream region, however, the conveyor belts 44 of the lower transport are also drawn. It can be seen that the distance between these conveyor belts 44 is greater than the width of the tube section 30 supplied, so that the tube section, when released, falls between these conveyor belts 44 and can reach the stack 52. The depositing of the tube section 30 on the stack 52 is supported by leaf springs 56, which extend in the longitudinal direction between the conveyor belts 40 of the upper transport and are fastened at a stationary support 58, so that, with their free ends, they press on the tube section 30 in the region of the leading edge.

Figure 3 shows the stacking device in a state, which chronologically is a little later than the state shown in Figure 1. The upper cross member 48 has just passed the downstream end of the upper transport 14 here, so that the tube section 30, supported by the action of the leaf springs 56, falls on the stack 52. The tube section still has a certain velocity component in the direction of motion, which, however, in the case of the preferred transporting speed of the transporting facility 12, is only slight (preferably less

than 60 meters per minute), so that the tube section comes to rest in position on the stack 52. If necessary the alignment on the stack is supported by a stop 60, which is mounted securely on the stacking table 54.

In Figure 3, the rear edge of the tube section 30 just passes through the lower cross member 50 and, accordingly, is also dropped on the stack 52.

Figure 4 shows the state at a sill later time. The cross member 48 has just been turned around here at the turn-around roller 46 and now returns on the underside of the lower transport. At the same time, the other cross member 50 has reached the corresponding position on the upper side of the lower transport where, together with the conveyor belts 40 of the upper transport, it now takes hold of leading edge of the next tube section 30, which is supplied at the proper time by the inlet section 32. This tube section is then pulled further forward. When its trailing edge has passed by the rear turn-around roller 46 of the lower transport and fallen down, it is caught by the returning cross member 48, so that it does not come into contact with the stack 52. Finally, the condition, shown in Figure, 1 is reached once again, so that a new cycle can commence.

When the stack 52 has reached the desired height, the conveyor belt, which forms the stacking table 54, is started up, so that the stack is transported away and a new stack can be formed in the stacking section 10.

For the stacking device described, the length of the tube section 30 can be varied within certain limits, since the distance between the cross member 48 and 50 must agree with the distances between the leading edges of consecutive tube sections and not with the precise length of the tube sections. Accordingly, a shorter length of the tube sections can be compensate for by appropriately larger spacings.

In a modified embodiment the lower transport 16 may also have more than two cross members, distributed uniformly over the length of the conveyor belts 44. In this case, the tube sections 30 are transported over a greater length, before they are

deposited on the stack. The cross members 48, 50 may then be fastened detachably at the conveyor belts 44, so that their number can be varied.

Since it is at least largely avoided with the device described that a new tube section, supplied to the stack, drags over the upper surface of the already formed stack a clean stack becomes possible especially in the case of sensitive, multilayer tube sections.